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**NATIONAL STANDARD OF THE
PEOPLE'S REPUBLIC OF CHINA**

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**Information technology - Biometrics - Characterization and
measurement of difficulty for fingerprint databases for
technology evaluation**

信息技术 生物特征识别 用于技术评估的指纹数据库的难度表征和测量
(English Translation)

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Table of Contents

Preface

Introduction

1.Scope

2 Normative References

3.Terms and Definitions

4.Abbreviations

5.Factors contributing to the differences in fingerprint samples

5.1 Basic Content

5.2 Common Area

5.3 Relative Deformation

5.4 Relative Sample Quality

5.5 Calculate the LOD of the dataset

6.Analyze the characteristics of paired sample data based on the comparison results

6.1 Basic Content

6.2 Match score

6.3 Constructing datasets with different difficulty levels

References

Foreword

This document is a report-type guidance technical document.

This document complies with the provisions of GB/T 1.1-2020 "Standardization Work Guidelines Part 1: Structure and Drafting Rules of Standardization Documents". Drafting.

This document is equivalent to ISO /IEC TR29198:2013 "Information technology - Biometric identification - Fingerprint data for technical assessment".

The document type of "Difficulty Characterization and Measurement of Libraries" has been changed from an ISO /IEC technical report to a national standardization guidance technical document in my country.

This document adds a chapter on "Normative References".

Introduction

In recent years, the testing and evaluation of fingerprint recognition systems and algorithms has been on the rise worldwide. Suppliers, testing organizations, and academic institutions are increasingly involved.

Technical institutions typically use their own datasets for testing, making it difficult to compare test results from different institutions. Evaluating test data... The method of using difficulty levels will improve the comparability of performance evaluation results on different fingerprint datasets.

ISO /IEC 19795-1 states. "In the evaluation of technologies, the same standard test set shall be used for all algorithms. The test data shall be provided by a..." A 'universal' sensor is used for data collection, meaning one sensor collects samples, and all algorithms are tested using the same samples. However, in Performance on this test set depends on the data collection environment and the data collected.

Comparing evaluation results from tests on different datasets can be misleading. Furthermore, different institutions have varying degrees of success in including or excluding low-quality data.

The varying standards used can lead to different results for the same algorithm on the same dataset. When trying to compare multiple evaluation results across different datasets... There are also certain difficulties. Currently, there is no universally accepted method to describe the difficulty level of datasets used in performance evaluation. When the number of datasets to be processed is known... When datasets are of equal difficulty, the ability to characterize the difficulty level of a dataset will help improve the accuracy of prediction operations.

The purpose of this document is to evaluate fingerprint data based on factors such as relative sample quality, relative rotation, deformation, and overlap between fingerprint imprints.

This provides guidance on the challenges and stress levels inherent in fingerprint recognition, used to characterize and measure fingerprint datasets used in technology evaluation.

Following the guidance in this document, users and system evaluators from different organizations can compare and interpret other datasets based on their difficulty levels.

This document proposes a method for generating datasets based on the analysis of comparison results or scores from various fingerprint recognition algorithms.

The method supports the creation of datasets with specific difficulty levels, as well as datasets for interoperability evaluation.

ISO /IEC 29794-4 defines a method for representing the quality score of a single fingerprint image. Such quality scores are typically used to predict matches.

The accuracy of the reference sample and probe sample is considered. In contrast, this document focuses on the differences between the reference sample and probe sample in terms of rotation, deformation, and common regions.

Note: As more standardized quality measurements become available that are suitable for predicting the performance of other biometric systems, other modalities will be considered in the future.

1 Scope

This document uses factors such as relative sample quality, relative rotation, deformation, and fingerprint overlap to estimate the impact of fingerprint datasets on fingerprint identification.

It provides guidance based on the level of challenge and pressure. Furthermore, it establishes methods for constructing datasets at different difficulty levels and defines the criteria used for... The relative difficulty level of the fingerprint dataset used to evaluate fingerprint recognition algorithm technology. The difficulty level depends on the reference sample and probe sample in terms of the factors mentioned above.

Differences in essence. This document includes the following.

---Describes the level of difficulty caused by differences between different samples taken from the same finger;

---Based on a summary of influencing factors, a statistical method was established to represent the difficulty level of the entire fingerprint dataset;

---Compare the difficulty levels of different fingerprint datasets;

---Defines the testing and reporting process for fingerprint dataset difficulty levels used in technical assessments;

---Analyze the characteristics of paired sample pairs based on their alignment scores;

--- Describes the method for selecting archived data to build the evaluation dataset.

This document provides guidance for comparing the relative difficulty levels of fingerprint datasets.

This document does not include.

---Defines the quality of a single fingerprint image;

---Define a method or specific metric for evaluating or predicting the performance of a fingerprint recognition algorithm.

2 Normative references

This document has no normative references.

3 Terms and Definitions

The following terms and definitions apply to this document.

3.1 Raw biometric sample

Information obtained directly from biometric sensors or after further processing.

3.2 Biometric reference

One or more stored biometric samples and biometric features that belong to the main body of biometric data and are used as objects of biometric comparison.

Examples. a face image on a passport, fingerprint detail feature point templates on an ID card, and a Gaussian mixture model in a database for speaker recognition.

Note 1: The generation of biometric references may be implicit or explicit and may require the use of auxiliary data, such as general background models.

Note 2: The subject/object tagged in the alignment may be arbitrary. In some alignments, biometric references may be used as references for other biometric features or... The input samples are the subjects to be compared and are fed into the biometric comparison algorithm. For example, in duplicate registration checks, biometric references are used as a basis for comparison.

The subject is compared with all other biometric references in the database.